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World Reporting Service on Plant Diseases and Pests

Recent Observations on Diseases of Cotton in the Sudan Gezira

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During the past three seasons Egyptian-type cotton (*Gossypium barbadense*), grown under irrigation in the intensively cultivated Gezira area of the northern Sudan, has suffered considerable damage from three diseases.

Cotton Leaf Curl Virus

In the season of 1953-54 a severe outbreak of the cotton leaf curl virus occurred throughout nearly 120,000 acres of susceptible Sakel cotton grown in the northern half of the Gezira. Scattered infected plants were observed in September, whereas leaf curl does not usually become evident until November-December. This disease spread rapidly and became widespread by the end of October when a very severe attack developed. In some fields as much as 30 to 40 percent of the crop was probably lost with, at a conservative estimate, 10 to 15 percent loss for the Sakel area as a whole; this represents a total loss of about 75,000 kantars of lint, equivalent to some 15,000 bales (500 pounds) worth, rather more than a million Egyptian pounds. In October, before the full extent of the leaf curl damage became apparent, the Sudan Gezira Board forecast a yield of 5.26 k.p.f.[1] in the most severely infected northern area, whereas the actual yield was only 4.24 k.p.f. Likewise the board forecast a yield of 5.02 k.p.f. for the whole Sakel area as compared with the actual yield of 4.23 k.p.f. These lower yields were attributed largely to leaf curl attack, since the forecast and actual yields of the leaf curl resistant XI 730 A variety of cotton in the Gezira were both about the same, 5.10 and 5.21 k.p.f. respectively. This severe and early disease outbreak almost certainly originated from infected okra (*Hibiscus esculentus*), a vegetable known to be a host plant of the cotton leaf curl virus. Cultivation of okra in the Gezira is forbidden by law between 1 June and 15 September, but in June-September 1953 it was surreptitiously grown in small irrigated gardens where perennial water is available and, probably, in sorghum fields where its presence is not easily detected. Cotton whitefly (*Bemisia tabaci*) transmitted the virus from such infected okra to the young cotton crop and ensured early appearance and rapid spread of the disease. Subsequent investigations in June-September 1954 confirmed that illegal out-of-season cultivation of okra had become a widespread practice in the Gezira and steps to remedy this were taken; since then no further serious outbreaks of leaf curl have occurred.

Blackarm Disease

In the following season (1954-55) blackarm, the bacterial disease due to *Xanthomonas malvacearum*, caused serious damage. This disease was widespread throughout the southern

[1] k.p.f. means Alexandrian kantars of seed cotton per feddan (approximately an acre); in the Gezira one Alexandrian kantar of seed cotton is about 315 pounds and yields about a kantar (100 pounds) of lint.

Gezira and very severe outbreaks occurred in the central Gezira, causing much heavier crop losses than for many years past. Probably the most serious losses occurred in the Darwish area in fields planted to the cotton variety X 1730 A. Some of the fields were so severely devastated at harvest time that they consisted largely of broken withered plants with hardly enough cotton to be worth the expense of picking (Figures 1 and 2). This area of some 3,800 acres of cotton yielded 3.67 k.p.f. as compared with 4.46 k.p.f. for the adjacent Kumor area sown with a blackarm resistant strain of X 1730 A cotton (X 1730 LI) which was only lightly infected. Since the yields in Kumor are normally slightly less than in Darwish, the crop loss attributable to blackarm in the latter area probably approaches one k.p.f., an estimate in accordance with those derived from field observations and other methods of estimation. Some fields were so severely damaged that they yielded less than one k.p.f., a crop loss of about 80 percent. For the whole Gezira crop loss caused by blackarm probably exceeded 50,000 kantars of seed cotton, equivalent to about 10,000 bales (500 pounds) of lint worth about 750,000 Egyptian pounds. This exceptionally severe outbreak resulted from a combination of several factors. Blackarm is favored by heavy rainfall, particularly post-sowing rain, and in some areas during September-October (i.e. post-sowing) the rainfall was heavier than usual and provided very favorable conditions for rapid and extensive spread of the disease. Thus at Darwish nearly five inches of rain fell in September 1954 and the total rainfall was 22.6 in., as compared with averages for the previous five years of 1.6 in. in September and 13.1 in. total. Sources of infection were more numerous than usual due largely to illegal transfer of cotton stalks and cotton seed from fields to villages at the end of the previous season, the stalks being used as fuel and in constructing temporary huts and the seed cotton for local spinning and as filling for matresses and cushions.

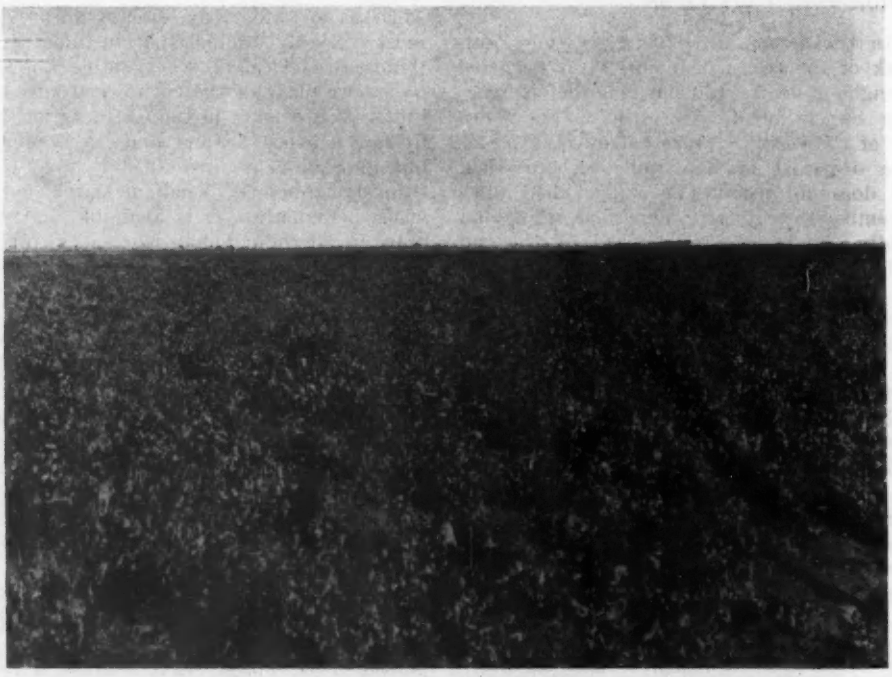

Figure 1. Severe attack of blackarm (*Xanthomonas malvacearum*) on cotton in the central Gezira.

Figure 2. Close view of cotton attacked by blackarm disease (*Xanthomonas malvacearum*).

During removal from the fields, some of this blackarm infected cotton material was inevitably dropped on roads and fields and thus dispersed over land sown with cotton a few months later. Investigation at the end of the 1954-55 season confirmed that such unauthorized removal of cotton material was widely practiced in the Gezira. Special precautions adopted to reduce the danger of blackarm carry-over from the heavily infected 1954-55 crop residues included early pulling out and destruction of the diseased cotton plants and the organization of a special control campaign throughout the Gezira to enforce the regulations prohibiting the unauthorized removal from the fields of diseased cotton stalks and seed cotton. This was followed by the planting of blackarm resistant cotton in the heavily infected areas for the succeeding crop. These measures appear to have accomplished their purpose in that the subsequent crop (1955-56) was only relatively lightly attacked by blackarm.

Wilt

Blackarm and leaf curl, although quite severe in a few localized areas, were relatively light in the 1955-56 season, but wilt was widespread in parts of the northwest and west central Gezira. It became apparent in October-November, when some plants died but many recovered after a varying amount of leaf withering and shedding. No reliable estimate of the crop loss is possible but it must have been considerable. The nature of this wilt is not understood. It has been suggested that it may result from inability of the plant to regenerate enough fine roots to replace those lost from natural causes, particularly so in October-November when increased water strain in the plant results from the combination of high air temperatures with the beginning of flowering and fruiting. At this critical period the water economy of the plant may be precarious and factors adversely affecting it might induce wilting.

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In the season under review such a predisposing factor may have been heavy whitefly (*Bemisia tabaci*) infestation, resulting, in much honeydew ("asal") over the aerial parts of the plants, but detailed investigation will be necessary to elucidate this evidently complex problem.

Stem Canker

Seedling stem canker caused by the fungus *Macrophomina phaseoli* appears to be encouraged by wet conditions, being very prevalent in 1954 and 1956 (wet years) and negligible in the relatively dry 1955-56 season. This disease is thought to begin as reddish spots on the cotyledons of seedlings a few weeks after sowing, thereafter spreading down the cotyledonary petiole to produce a reddish-purple discoloration, later becoming brown and fibrous at the cotyledonary node. The young stem may break at this lesion and in this way considerable damage occurs. Usually, however, infected plants recover with the advent of dry weather albeit probably suffering appreciable check to early growth. This disease might become more serious if earlier sowing of cotton were practiced in the Gezira. Although not investigated, it is thought that infection orginates from the soil, possibly from sclerotia of the fungus therein. In a soil fumigation experiment carried out in 1954, stem canker was observed to be most abundant in plots which had been fumigated with chloropicrin. It is likely that the resistant sclerotia of *M. phaseoli* survived fumigation to a greater extent than soil fungi without resistant propagating organs, which may have led to a reduction in competing and possibly antagonistic soil micro-organisms, thus permitting a buildup of *M. phaseoli* in the soil of the fumigated plots.

Powdery Mildew

Powdery mildew (*Leveillula taurica*) was observed for the first time on cotton in the Sudan in December 1955 at Shambat, near Khartoum and some fifty miles north of the northern limit of Gezira cotton. It occurred on both Egyptian-type (*Gossypium barbadense*) and American-type (*G. hirsutum*) cottons in plant breeding plots laid down by the Empire Cotton Growing Corporation. *L. taurica* occurs commonly in the Gezira and northern Sudan on a wide range of wild and cultivated plants, including several Malvaceous species, e.g. *Hibiscus esculentus*. The pathogen probably exists as numerous races showing varying degrees of host specialization and it had been expected that cotton would eventually be attacked. The damage was not severe but the evolution of a race of *L. taurica* virulent to cotton might have serious consequences for the intensively cropped Gezira cotton area. Infected plants of valuable breeding material were dusted and the others were pulled out and burned, thereby, it is hoped, reducing the chances of the pathogen spreading to Gezira cotton. The disease may have spread to cotton from weeds such as *Euphorbia heterophylla* since it has been found that *L. taurica* can pass from several weeds and field bean (*Vicia faba*) to cotton and *vice versa*.[2] Perithecia of this powdery mildew are relatively rare but were recently found for the first time in the Sudan; they occurred on safflower (*Carthamus tinctorius*) near Gedaref and in the Gash Delta. In addition to cotton and safflower, other hosts of *L. taurica* recently observed in the Sudan are caraway (*Carum sativum*) and the weeds *Withania somnifera* and *Sesbania* sp.

[2] NOUR M.A. 1956. *Leveillula taurica* on cotton. *Commonw. Phytopath. News*, 2: 44-45.

Co-operation of World Tourists Sought in Plant Quarantine Enforcement

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MORE effective education of tourists in their responsibilities for protecting the United States against the introduction of foreign plant pests is being given increased emphasis by United States plant quarantine officials. The jet age that is shrinking distances and elapsed time between remote parts of the world has necessitated such an enlistment of tourist co-operation to safeguard American plant life.

Tourist Education

On the basis of previous years' experience, it is estimated that plant quarantine inspectors stationed at international airports throughout the United States will be called upon to inspect 110,000 aircraft arriving from overseas in 1957. If past years' experiences continue, some 38 percent of these aircraft will contain unauthorized plant material, either in the personal baggage of passengers or crew, or in cargo. In 1956, nearly 2,700,000 passengers arrived by air, an increase of 18 percent over the previous year. Estimates forecast 4,400,000 international passengers in 1958, an increase of over 60 percent in two years. The problem is also being complicated by the opening of new traffic lanes and by the more frequent use of interior airfields by overseas commercial and military aircraft.

Information now being directed to American tourists calls their attention to precautionary measures they should take to avoid accidental introduction from abroad of injurious insects and destructive plant diseases. The educational campaign under way is directed at reducing the individual lots of contraband plant material, fruits and vegetables that arrive in fresh condition after only a few hours' air travel from practically every accessible part of the world. Hundreds of the insects and plant diseases that are found in such products are of plant quarantine significance. Inspectors must also be ever alert for free-flying insects that do not succumb to public health insecticidal aerosol treatment of incoming aircraft.

One of the important new methods of tourist education is a reference to plant quarantine requirements that appears in a recently adopted, simplified U.S. customs baggage declaration form. Plant quarantine requirements are also cited in a leaflet "Custom Hints" that is widely distributed to American tourists before departure.

A picture story sheet distributed by the Office of Information, U.S. Department of Agriculture in July 1956 is another publicity item that has been widely used as source material by numerous publications. Containing eight human interest photographs of plant quarantine activities and an interesting description of the imperative need for such restrictions, the information has been used by several national magazines.

A color, sound motion picture produced by the U.S. Department of Agriculture, also designed to inform the travelling public of the need for plant quarantine enforcement, will soon be available to TV stations, transportation agencies, and other interested groups.

Co-operation of International Airlines

At least seven international airlines have made major contributions to educating air travelers in plant quarantine as well as other protective regulations. For example, one airline has issued an attractively illustrated booklet on "How to clear U.S. Customs the easiest way". In this booklet there is a

prominent paragraph calling attention to special requirements for the importation of many fruits, vegetables, plants, seeds and flowers, including corsages or leis. Travellers are encouraged to consult the airline for details of the current plant quarantine requirements. This may forestall many of the disappointments that often result when tourists try to clear customs with plant material that is either prohibited or has restricted entry.

Insects Found in Transit

A situation that has emphasized the need for a more direct approach to the arriving air traveller is the recent outbreak of the Mediterranean fruit fly in Florida. Some of those engaged in the current eradication campaign there believe that the fly was introduced through air travel. The initially discovered and heaviest infestation straddled the International Airport at Miami. The conjecture is that the fly was introduced, perhaps a year before its discovery in April 1956, as a result of larvae from infested fruit contained in air passengers' baggage. Whatever its means of establishment, Federal and State officials are determined that there shall be no further re-entry of this and other destructive pests into the United States.

Free-flying insects in airplanes are not considered to constitute as much of a hazard as are infested products. The possibility of their presence is never overlooked, however. Illustrative of the potentials are the 67 Japanese beetles that inspectors found during 1956 in an aircraft arriving in Hawaii from Hanedo Airport in Japan. Forty-eight of these were alive.

On another occasion, an overseas aircraft that originated in Cairo, stopping en route at Paris, was found upon arrival in the United States on 26 June 1956 to contain 51 live adults of the European chafer. This destructive pest of sod and pasture had been previously accidently introduced and established in several limited areas of northwestern New York State. The plant quarantine inspectors who examined the aircraft were informed by crew members that during their stopover in Paris the chafers were swarming around the lights at the airport. Specimens were found in passenger baggage and cargo compartments.

Just a few illustrations of the interceptions from air passengers are sufficient to establish the importance of this mode of insect transportation. A California-bound passenger arriving at New York by plane from a South American country brought along half a pound of fresh coffee berries to show his family. A living larva of the Mediterranean fruit fly was found in each of five berries in the lot. As many as 64 specimens of this species have been detected in oranges removed as garbage from an inbound Spanish plane landing at Miami, Florida. This species is intercepted from 150 to 200 times each year, principally from lots of fresh fruits destined to all parts of the United States.

Foreign Co-operation

Information to the travelling public is also channeled to visitors from overseas through United States consular officers. In addition, Agricultural Attachés are briefed on agricultural quarantine regulations prior to their assignment to foreign posts and are kept informed of current requirements through the Foreign Agricultural Service of the U.S. Department of Agriculture. These officials are in a strategic position to inform tourists planning to visit the United States of existing restrictions and prohibitions.

These educational efforts supplement actual inspection of arriving plant material and are in no way a substitute for the examination of baggage and cargo. A better informed travelling public, however, will strengthen plant quarantine protective measures and lessen the hazard of pest introduction now that the air age affords insects and plant diseases a means of quick dispersal to and from all parts of the world.

Plant Disease Situation in the United States[1]

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Root Lesion Nematode Damaging Fruit Trees in New York

PARKER and MAI[2] report that for several years cherry growers in certain areas in western New York have experienced failure of replants in old orchards and of new plantings in old orchard sites. These orchards are on light-textured usually well-drained soils, considered as the best orchard soils in the State. The best known cultural treatments have been followed, and soil analyses show an adequate level of the major mineral nutrients and a satisfactory pH level, but low organic matter content. No evidence of injury by winter temperatures was found.

Previous field soil fumigation tests indicated that a major factor in this trouble is the root lesion nematode, *Pratylenchus penetrans* (Cobb). The growth of cherry trees in infested soil treated with a nematocide was from two to four times that of untreated checks. Further evidence in this connection has now been obtained from recent inoculation experiments and field surveys.

In late summer, young Mazzard cherry seedlings, grown from seed in steam-sterilized soil, were inoculated with large numbers of *Pratylenchus penetrans* obtained from affected roots of orchard grass (*Dactylis* sp.). Several weeks later, several of the inoculated trees wilted, and the growth of the inoculated trees was uniformly less than that of the checks and the leaf color was a lighter green. Many of the roots of the inoculated trees were dead, and all roots on affected trees were grayish in contrast to the normal white roots of the checks. The roots were examined for nematodes and large numbers were found in the roots of inoculated trees (average of 1835 per root system of trees) with very few on the checks (average of 3 per root system of trees).

The typical distribution of diseased sour cherry trees within an affected area is partly at random and does not follow the pattern of poor growth usually associated with unfavorable physical soil conditions or poor nutrition. Large numbers of *Pratylenchus penetrans* are commonly found on weakened trees in these areas, but not on the weakest ones, those making almost no growth. In a typical root system of an affected orchard tree, one root has made fair growth in sharp contrast to the very poor growth in all the other roots of the tree, with an abundance of a bunchy type of growth resulting from rootlet proliferation. Most of the rootlets in these crowded bunches are dead. The roots of orchard grass, crab-grass (*Digitaria* sp.), lamb's-quarters (*Chenopodium* sp.), and pigweed (*Amaranthus* sp.) growing in an affected cherry orchard were also found to be infected.

In 1955, a limited survey was made, partly at random, within the major fruit-growing areas along Lake Ontario and in Orange County in the Hudson River Valley. Substantial numbers of *Pratylenchus penetrans* were found in five of the sour cherry orchards examined in three counties. The numbers of nematodes found in the various root samples often were not correlated with the apparent damage to the roots. In fact, the lowest counts frequently were obtained from the most severely damaged roots, particularly those with few feeder rootlets. This indicates that populations of pathogenic nematodes are drastically reduced when their feeding depletes the food source. One young apple orchard, examined because of unexplained

[1] This report is based upon material submitted by Collaborators of the Plant Disease Epidemics and Identification Section, Agricultural Research Service, United States Department of Agriculture.

[2] PARKER, K.G., and MAI, W.F. 1956. Damage to tree fruits in New York by root lesion nematodes. *Plant Dis. Reptr. 40:* 694–99.

poor growth, was shown to be heavily infested by the root lesion nematode. The nematodes were found in the one pear orchard and one plum orchard examined, although they had no apparent relation to poor growth. The occurrence of these nematodes was irregular in the peach orchards studied.

These facts support the conclusion that cherry orchards are severely damaged by the root lesion nematode and that apple trees are very likely damaged, but probably to a lesser extent. Root lesions have been observed on peach, but it has not been determined whether peach trees are significantly damaged. Data on other fruits are too limited to warrant any conclusion, except that the nematodes are common when conditions are favorable for their growth. It is interesting that in several instances severe damage to cherry occurred in plantings that followed peach or apple. At times greater damage was evident where peach or apple had been grown previously, than where other fruit species or other crops had preceded cherry.

Also of interest is the fact that all these orchards with the nematode problem were located on light-textured soils, usually well drained, but sometimes with poor underdrainage. The nematode is present, but less damaging in sour cherry orchards on medium-textured soils and apparently nonexistent on heavy soils.

Apparently both Mazzard and Mahaleb cherry root-stocks are damaged by root lesion nematode although, in general, growth of trees on Mazzard roots seems to be somewhat better.

Substantial numbers of *Xiphinema* sp. have been found in soil adjacent to roots of poorly growing sour cherry, sweet cherry, peach and apple trees. Large populations of *Criconemoides* sp. were found in soil samples from problem orchards of peach, sour cherry and plum, and *Paratylenchus* sp. was found around a poorly producing peach tree in a single orchard. The relationship between the presence of these potentially pathogenic nematodes and the poor growth of the tree is not yet known.

Outbreaks and New Records

Denmark

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Plant Diseases and Pests in 1956

THESE notes summarize briefly the highlights of the plant pest situation for 1956. The cold winter killed the weaker varieties of wheat, but in general favorable precipitation and good growing conditions resulted in crop yields slightly above average.

CEREALS. Manganese deficiency is increasing but it can be corrected by spraying with manganese in both cereals and beets. Copper deficiency in cereals, commonly called white tip, can be remedied economically and effectively by spraying with about ten pounds of copper sulphate per acre.

The cereal root eelworm (*Heterodera major* O. Schmidt) is a serious pest and care has been taken to prevent its spread through farm machinery, shoes, etc. moving from an infested to a non-infested field. The wheat midges (*Contarinia tritici* Kirby and *Sitodiplosis mosellana* Géh.), which have been rare for many years, have appeared again in some localities. The frit fly (*Oscinis frit* Linn.) was more destructive and widespread in 1956 than it had been for many years. This may have been at least partially due to the cool wet spring, as the most severe injury occurred in the low wet areas.

Heavy outbreaks of the aphid (*Rhopalosiphum padi* Linn.), and to a lesser extent of *Macrosiphum granarum* Kirby, were satisfactorily controlled by spraying or dusting with parathion.

ROOT CROPS. Beets infected with the yellow virus (*Beta* virus 4) were noted in one province. Apparently the virus originated from beet seed fields and clamps (beets in storage) where large numbers of overwintering green peach aphids (*Myzus persicæ* [Sulz.]) were observed. Spraying with parathion (1 pound per acre) to control the aphids was satisfactory in preventing the spread of the virus.

Carrion beetles (*Blitophaga opaca* Linn.) were controlled by spraying with parathion at a rate of about one pound per acre or by dusting with Bladan at the rate of 15 to 20 pounds per acre of a dust containing 1.5 percent methyl parathion.

Mongold fly (*Pegomyia hyoscyami* Panzer) larvae were controlled by spraying with parathion at a dosage rate of from one half to one pound per acre. An unusually large number of tortricids (*Cnephasia* spp.) appeared in beet, swede (rutabaga) and chicory fields which were controlled by spraying with parathion at the rate of two pounds per acre or less.

Cabbage thrips (*Thrips angusticeps* Uzel) were very common on beets and cruciferous crops. Seed treatment with a mixture containing 10 percent thiuram and 75 percent lindane used at the rate of 45 grams per kilogram of seed gave control for only a short time, but spraying with parathion gave effective results. Dusting with DDT or the seed treatment used against cabbage thrips gave effective control of flea beetles (*Phyllotreta* spp.) on swedes.

Damage by the turnip root fly (*Chortophila floralis* Fall.) was less than normal, the attacks apparently being weak in the centers of infested areas. The swede midge (*Contarina nasturtii* Kief.) was common but not very injurious except to cabbage and cauliflower.

POTATOES. Large numbers of the Colorado potato beetle (*Leptinotarsa decemlineata* [Say]) were present in a limited triangle close to the German frontier and the North Sea. Experiments have shown that these beetles can overwinter in Denmark. However, outbreaks have never occurred two years in succession in any given area. This is probably due to the prompt notification given by farmers to the control officials of the presence of the insects and to intensive and effective control measures applied. Potato late blight (*Phytophthora infestans* [Mont.] De Bary) developed late and did not materially influence the yield but did cause some tuber infection in light soils.

VEGETABLES. Although not previously found in Denmark, the cucumber virus (*Cucumis* virus 2) caused a great deal of damage to cucumbers in the hothouse in 1956. Likewise, *Ascochyta citrullina* Smith, which had been considered rare and innocuous, was very destructive in some cucumber hothouses. Spraying with copper oxychloride at a rate of 7 to 8 pounds per acre gave good protection against this disease. Potato late blight seriously injured field-grown tomatoes where control measures were neglected.

El Salvador

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Psorosis of Citrus

The dreaded psorosis virus disease of citrus was found on the Altamira estate near San Salvador. On this estate 29 of 63 Hamlin orange trees, one of 18 Valencia and four navel orange trees were found infected with this disease (Figure 1). The Hamlin orange trees, budded on sour orange stock, were obtained from the nursery of Mr. David Abrego, Soyapango, Canton Buena Vista, El Salvador. This variety was originally introduced from the United States but no definite details are available about its early introduction.

As soon as discovered, the owners eradicated all of the diseased trees with the hope of preventing its spread to other non-infected trees.

Figure 1. Hamlin orange tree showing lesions caused by psorosis.

As far as is known, this is the first time that this dreaded disease has been found in Central America and emphasizes the need for effective plant quarantine regulations to prevent the introduction and spread of this and other destructive diseases and plant pests into Central America.

Iraq

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Yellow-Red Virus Disease on Peach Trees

A disease causing defoliation and die-back of peach has been observed in Iraq for two years and tentatively identified as the yellow-red virus disease of peach (also called western X or eastern X diseases in the United States of America). Forty percent of the trees were severely defoliated in a young orchard on the Miri-Sirf headquarters farm near Kirkuk.

The foliage of the diseased peach trees appeared normal in the spring except for some reduction in the vigor of the growth and a slightly lighter green cast. Later, with a rise in temperature, irregular yellow and red spots appeared on the diseased leaves (Figure 1). The leaves became brittle, the irregular spots fell out producing a lacerated, shot-hole appearance, and the leaves fell, leaving only small, late-formed terminal leaves. After the twigs were denuded of leaves the bark usually turned red. At first, only part of the limbs were affected by the defoliation and die-back, while the others remained green, but eventually the entire tree became involved and died.

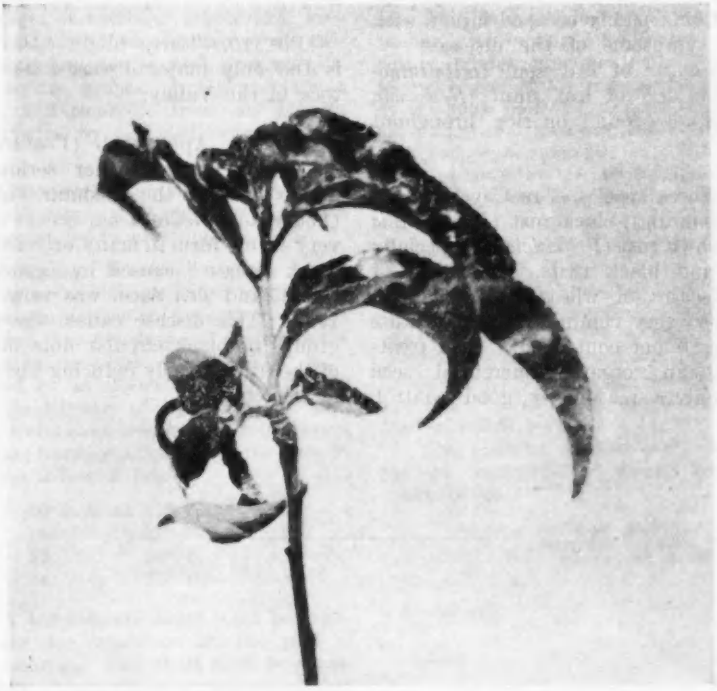

Figure 1. Peach twig showing symptoms of yellow-red virus disease.

Kashmir

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Notes on Plant Diseases

The principal crops of agricultural importance in the Kashmir Valley are rice, wheat, corn, potato and apple. They are subject to attack by diseases which, due to favorable climatic conditions, may become epiphytotic and cause considerable losses.

RICE. The most important disease of rice, commonly called "Rai disease", is a combination of two diseases, namely, blast (*Piricularia oryzæ*) which is the major cause of the damage, and stem rot due to *Sclerotium oryzæ*. A severe outbreak of the "Rai disease" caused an almost complete crop failure of the local paddy varieties in August and September 1956, whereas the improved varieties of China paddy escaped injury with only minor symptoms of the disease.

Trace amounts of leaf spot (*Helminthosporium oryzæ*) and of leaf smut (*Neovossia horrida*) were also found on rice throughout the Valley.

WHEAT. Three species of rust, yellow rust (*Puccinia glumarum*), black rust (*P. graminis tritici*) and brown rust (*P. triticina*), especially the yellow and black rusts, are the most important diseases of wheat. Bunt (*Tilletia foetida*), is also very common and may cause serious losses if not controlled. Seed treatment with an organic mercurial seed disinfectant gives reasonably good control. Among the minor diseases noted in the Valley are loose smut (*Ustilago tritici*) and powdery mildew (*Erysiphe graminis*).

MAIZE. Smut (*Ustilago zeæ*) causes considerable losses in all the maize-growing areas of the Valley. A very severe epiphytotic of leaf blight (*Helminthosporium turticum*) occurred in 1956. The disease started appearing in August and caused the leaves to turn brown prematurely, greatly reducing the yield and causing many of the ears to break off and fall to the ground. The disease was especially destructive on a farm where the hybrid variety U.S. 13 was grown for seed.

Traces of maize rust, *Puccinia* sp., have been found in all the maize-growing areas.

POTATO. Early blight (*Alternaria solani*) is the only major disease that attacks potatoes in the Valley.

APPLE. Apple scab (*Venturia inæqualis*) frequently causes rather serious losses to apples grown in the Kashmir Valley. Mildew (*Podosphæra leucotricha*) occurs annually in a very severe form in many orchards. The "fly speck disease" caused by *Leptothyrium pomi* (Mont. and Tr.) Sacc. was very prevalent in 1956. This disease causes the formation of groups of black circular dots on the surface of the fruit, greatly reducing the market value of the crop.

Plant Quarantine Announcements

Costa Rica

Decree No. 31 of the Ministry of Agriculture and Trade of 25 October 1956, published in the *Diario oficial*, Vol. 78 No. 257, of 13 November 1956, provides new plant quarantine regulations. This Decree, which is based on Phytosanitary Law No. 14 of 8 November 1929 as amended by Law No. 701 of 7 November 1949, came into force on the day of its publication.

1. To protect national agriculture and to prevent the entry of nematodes, especially *Heterodera rostochiensis*, insects, fungi, etc., the importation of any agricultural plant materials (living plants, parts thereof, seeds, bulbs, tubers, roots, rhizomes, fruits, etc.) which carry sand or soil, is prohibited. Any such material imported will be confiscated and destroyed or returned to the country of origin.

2. To prevent the introduction of the Mediterranean fruit fly (*Ceratitis capitata*) the importation is prohibited of any fruit with soft pericarp including oranges, tangerines, grapefruits, lemons, mangos, mamey (*Mammea americana*), guavas, rose apples (*Syzygium jambos*), peaches, persimmons, nectarines, grapes, prickly pear fruits, cherry coffee, and tomatoes from any locality or country infested by the Mediterranean fruit fly unless:

a) The importer has obtained a permit from the Ministry of Agriculture for each shipment before ordering the goods.

b) The shipment is accompanied by a phytosanitary certificate issued by the competent authorities of the country of origin stating that the shipment, including the packing, has been fumigated or disinfected by an efficient method approved by the Ministry of Agriculture, or that the fruits have been kept in cold storage during transportation and at the temperatures indicated below:

10 days at 32° F.
11 " " 33° F.
12 " " 34° F.
14 " " 35° F.

A temperature chart must be maintained for inspection at the port of destination. This chart must be signed before transportation by a phytosanitary or quarantine inspector of the country of origin stating that, when the fruits were shipped, the cold store had been at the required temperature.

c) The shipments have been inspected at the port of entry.

The following territories are declared as being infested by the Mediterranean fruit fly: Azores Islands, Canary Islands, Portugal, Spain, Italy, Hungary, Greece, Cyprus, Turkey, Syria, Israel, the continent of Africa with adjacent islands, Australia, Tasmania, New Zealand, Brazil, Argentina, Bermuda Islands, Hawaii, the Philippines, the State of Florida of the United States and Costa Rica.

3. To prevent the introduction of the citrus canker disease (*Xanthomonas citri*) it is prohibited to introduce citrus fruits from East and Southeast Asia, Burma, India, Ceylon, Thailand, Indochina, China, Oceania (except Australia and Tasmania), Japan and from the east coast of Africa and Mauritius.

4. The introduction into the country of cotton seed for planting or industrial use, or cotton containing seed in any form (except manufactured cotton, fabrics, processed cotton) is regulated as follows to prevent the introduction into the country of the pink bollworm (*Pectinophora gossypiella*), the potato root eelworm (*Heterodera rostochiensis*) and *Anthonomus vestitus:*

Importers of the above-mentioned material must obtain a permit from the Ministry of Agriculture for each shipment before ordering the goods; in this permit the port of arrival in Costa Rica is indicated.

Cotton seed for planting must be accompanied by a phytosanitary certificate issued by the competent authority of the country of origin. On arrival this material, without exception, will be fumigated by an adequate method. The fumigation expenses will be charged to the importer or the interested person.

The rates of application of methyl bromide for the fumigation of cotton seed and cotton products are:

	Minimum temperature	Dosage per 1000 cu. ft.	Time of exposure	Mercurial vacuum pressure
Atmospheric	40° F.	3 lb.	24 hours	—
Vacuum	40° F.	4 lb.	2 hours	26 in.

5. With regard to fruit and vegetables, the regulations contain the following restrictions:

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a) Any importer of fruits and vegetables must obtain a permit from the Ministry of Agriculture for each shipment before ordering the goods.

b) Any importation of fruits and vegetables, except those specifically prohibited, must be inspected by a quarantine inspector. When goods are found to be infested by diseases or pests, fumigation with an adequate fumigant will be required.

c) Fruits, vegetables, plants, etc. introduced by travellers in luggage and not accompanied by phytosanitary certificates as well as by the import permits of the Ministry of Agriculture will be confiscated and destroyed.

6. The importation of all parts of plants of the genus *Saccharum* (sugar cane), including any kind of non-processed or unmanufactured raw sugar cane pulp, is prohibited.

7. Potatoes (*Solanum tuberosum*) and all varieties of this genus may not be imported for planting or consumption from countries where the potato root eelworm (*Heterodera rostochiensis*) exists.

The countries infested by the potato root eelworm are: Scotland, Germany, Ireland, Sweden, Denmark, the Netherlands, Spain, France, Finland, Belgium, Peru and possibly other South American countries, Mexico, Norway, Luxemburg, Poland, Switzerland, Yugoslavia, Wales, Algeria, Greece, Canary Islands, Chile, Australia, Austria and Japan.

From countries where the potato root eelworm (*Heterodera rostochiensis*) and the wart disease (*Synchytrium endobioticum*) do not exist, potatoes may be imported under the following conditions:

a) The importer must obtain a permit from the Ministry of Agriculture for each shipment before placing the order.

b) The shipment must be accompanied by a phytosanitary certificate and, in addition, each case or packing must contain a certificate stating that the potatoes were examined by an authorized officer in the field where they were grown and again before shipment.

c) Potatoes should not be packed in sacks which have been used for transporting potatoes.

d) Potato shipments will be inspected at the port of entry.

8. The following packing materials are prohibited, unless they have been processed or treated with chemicals to eliminate the risk of pest transmission: straw or husks of rice, straw or chaff of wheat, straw or parts of the maize plant, sorghum, Sudan grass hay, teosinte (*Euchlaena mexicana*), jobs-tears (*Coix lacryma-jobi*), cotton or cotton derivates containing seeds, raw sugar cane pulp, leaves of any plant, soil, etc.

9. All cut flowers and inflorescences and parts of plants attached to them are subject to inspection, treatment and destruction.

All such materials may be imported if dried, bleached, or treated with chemicals to exclude the risk of carrying pests.

10. Importation of all species or varieties of the genus *Theobroma* (cacao tree), seeds, plants, etc. is prohibited.

For scientific purposes the importation of seeds and plants of this genus is permitted if the Ministry of Agriculture grants a special permit. The material imported under such a permit will be inspected and fumigated if its sanitary condition makes this necessary.

11. Unhulled rice imported for seed or for food must be inspected and, if necessary, fumigated or treated in an appropriate way.

Rice for seed must be accompanied by an inspection and fumigation certificate stating that it has been treated by an adequate method.

Polished and hulled rice is not subject to quarantine.

Importation of rice straw and hulls is subject to the restriction mentioned under "Packing materials".

12. Importation of living plants, seed and vegetative parts of all species of the genus *Coffea* (coffee tree) is prohibited.

Processed, polished and toasted coffee is not subject to this prohibition.

For scientific purposes the importation of plants and seed is permitted if the Ministry of Agriculture grants a special permit. These importations will be inspected and fumigated if the sanitary conditions require it.

Coffee plants or seed in transit are subject to these quarantine regulations.

13. Importation of seeds, fruit trees, ornamental plants, forest trees, bulbs, tubers, roots, shoots, rhizomes, etc., not specified previously, is subject to the following regulations:

a) Importers must request an import permit from the Ministry of Agriculture, prior to importation.

b) The shipment must be covered by a phytosanitary certificate issued by the competent authority of the country of origin.

c) The specified agricultural plant material will be inspected on arrival to determine its sanitary conditions and to decide in each case what measures should be taken to comply with the law and its regulations.

14. The importation of fruit trees of the genus *Citrus* from the following territories is prohibited: East and Southeast Asia, Burma, India, Ceylon, Thailand, Mauritius, Hawaii, the Philippines, Argentina, Brazil, Paraguay and Uruguay.

Importations from countries not mentioned above are subject to permits granted by the Ministry of Agriculture before the ordering of the goods.

Each shipment must be accompanied by a phytosanitary certificate of the country of origin and must be free from soil. It will be inspected by the quarantine inspector, who will decide upon the treatment to be applied.

15. Importation of avocado seed, fruits and trees is prohibited unless accompanied by a phytosanitary certificate certifying that in the country of origin the following pests do not exist:

Heilipus lauri
Conotrachelus spp. (seed)
Ceratitis spp. (fruit)
Stenoma catenifer
Anastrepha spp. (fruit)

A permit must be obtained from the Ministry of Agriculture before placing the order. The material will be examined on arrival by a quarantine inspector and fumigated if necessary.

16. All agricultural plant material intended for export and which requires a phytosanitary certificate shall be thoroughly examined by the authorized officers and the certificate shall be issued in accordance with the International Plant Protection Convention.

17. In order to identify correctly all agricultural plant material such as seed, bulbs, tubers, plants, etc., of any class introduced into the country, the material must be duly labelled, indicating the genus and species or, in default, the vernacular name under which it is known in the country of origin.

News and Notes

FAO Meeting on Rice Storage and Processing

The *ad hoc* Working Party on Storage and Processing of Rice, established by the International Rice Commission, met in Calcutta, 5-10 November 1956. Delegations attended from Burma, Ceylon, France, India, Indonesia, Japan, Netherlands, Pakistan, Thailand, United States of America and Viet-Nam. The meeting was convened to assemble the latest information and study the technical aspects of storage and processing of rice and to recommend to the Commission what steps should be taken to reduce losses in stored rice and improve processing techniques.

Of the recommendations made by the Working Party, the following are of interest to those concerned with plant protection:

1. Governments should undertake studies leading to the development of practical and universally applicable techniques for accurate determination of losses in stored rice.

2. FAO should continue to assemble information on the extent of losses in stored rice and should make this information available to member countries as a means of emphasizing the need for greater attention to the reduction of such losses.

3. FAO should obtain complete information on the dosages of insecticides which may be applied to grains in various countries and make this information available to Member Governments. FAO should also obtain and distribute information on the existing legal tolerances of insecticide residues on stored grains in various countries.

4. FAO should review all available information on the degradation of insecticide residues in stored grains for the purpose of formulating recommendations in regard to the safety and feasibility of direct mixing of insecticides with grains for insect control. Meanwhile, governments should continue investigations on residues and should keep FAO informed on the results obtained.

5. Governments should intensify investigations on safe, more effective, cheaper, and more practical means of insect control in stored rice.

6. In all investigations on the control of pests infesting rice, the quality and nutritive value of rice should be safeguarded.

International Rice Commission

The Fifth Session of the International Rice Commission (IRC) was held in Calcutta, 12-19 November 1956. Delegates attended from Australia, Burma, Ceylon, Dominican Republic, France, India, Indonesia, Italy, Japan, Laos, Netherlands, Pakistan, Thailand, United States of America and Viet-Nam. During the session, the Commission heard and discussed reports of its working parties and *ad hoc* working groups concerned with production and conservation of rice. A paper discussing action which might be taken to reduce losses of rice in the field is of special interest. The final report of the session contains 22 recommendations of which the following have a direct bearing on plant protection:

1. FAO should take steps to develop intercountry co-operation with regard to the reduction of losses of rice in the field due to insects, diseases, and other pests, and in so doing should take fully into account the need for co-ordinating this work closely with other activities sponsored by the Commission regarding rice production.

2. In making provision for the continuation of the work which has been initiated in reducing losses in stored rice, full account should be taken of the need for attention to both the entomological and engineering aspects of storage.

New Laboratory for Biological Pest Control in India

The Governments of India and Canada have announced the establishment of a biological control laboratory under the Colombo plan. It is to be known as the Bangalore Station of the Commonwealth Institute of Biological Control. The laboratory building was completed and occupied early in 1957. Dr. V.P. Rao has been appointed on the staff of the Commonwealth Institute of Biological Control as Officer-in-charge of this new station. Entomologists visiting India are welcome at the laboratory, but, whenever possible, are urged to give Dr. V.P. Rao, Bellary Road, P.O. Box 112, Bangalore (1), India, advance notice of their intended visits.

Roma - Tip. del Senato del dott. Giovanni Bardi